Evaluation of Digital Libraries: A Case Study

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Abstract. The paper discusses the need for digital library evaluation. It provides insight into a framework for digital library evaluation. The paper also discusses various evaluation techniques in detail. Examples of major digital library evaluation projects underway world-wide are also included. The paper presents a detailed case study of digital library evaluation conducted by the Management Development Institute, India. Techniques used and the results of the evaluation are also discussed.

Keywords: Digital libraries; Evaluation**;** Evaluation methods

1 Introduction

In recent years, the library and information services sector has undergone major changes in terms of collection, organization and services. Today's libraries are dynamic information systems which have the power to reach out to its users without the restrictions of geographical boundaries as never before. Rapid advances in information and communication technologies have transformed the nature, content, format and even concept of libraries. Thus the evolution of digital libraries can be traced to the integration of technology with traditional library tools to meet the ever increasing information needs of the user community. Today, libraries across the globe are fast moving to the 'digital' mode. However, the development of digital libraries requires huge investment in terms of money, manpower, technology, etc. Hence it is necessary that time-bound evaluations are carried-out to ensure that the digital libraries are meeting the objectives for which they are established. But the basic purpose of evaluation should be to help the decision making process. Evaluation should be conducted to provide the decision makers with the information they need to make the best possible decisions. People involved with the development and management of digital libraries need to make a number of decisions at various stages to ensure the success of any digital library project. Though the development of digital libraries has reached a mature stage, the evaluation has not kept pace (Jeng, 2005).

ARD Prasad & Devika P. Madalli (Eds.): ICSD-2007, pp. 229-238, 2007

Evaluation is defined as “the systematic process of determining the merit, value, and worth of something” (Fuhr, et al, 2006). In digital library (DL) context, the evaluation can be seen as the process of determining whether initial objectives or purpose for which the system has been setup is achieved or not. Evaluation is often confused and/or is interchangeable with performance assessment. Both performance assessment and evaluation involve the collection of information to make decisions. However, evaluation is more focused on things like systems, products, and services, whereas, assessment is focused on users, their aptitudes, attitudes, etc. In other words, performance assessment is an activity used within the evaluation framework.

It is necessary to address the following questions before-hand while one is planning an evaluation process:

- What is the purpose of evaluation?
- What can be evaluated?
- How to evaluate?
- When is it appropriate to evaluate?

Answering these questions prior to starting the evaluation will bring a lot of clarity to the entire evaluation process. Digital libraries are complex systems. The methods and metrics for the evaluation of digital libraries may vary based on whether they are viewed as institutions, as information systems, as new technologies, as collections, or as new services (Fuhr, et al, 2006).

2 Types of DL evaluation

Evaluation is required to be conducted at various stages of a DL development project. Some of the prominent types are discussed below.

2.1 Formative Evaluation

Formative evaluation is usually done at the beginning of the DL development project. In the beginning itself, before setting up the DL, one would like to verify whether assumptions are correct or not. It is quite similar to a market survey. One would like to see how the user community will respond to certain services being planned to be a part of the system. Based on the feedback / results of the evaluation, necessary changes can be incorporated in the plan. Formative evaluation provides insights into needs of the user community and helps to take corrective measures at the beginning of the DL development project.

2.2 Summative evaluation

Summative evaluation is one which is conducted at the end of a DL development project. It is basically done to understand whether initial objectives with which the system was set up is achieved or not. It is very important to carry out summative evaluation at the end of the DL development programme.

2.3 Iterative evaluation

Iterative evaluations are interim evaluations which are conducted during the DL development. These 'in-between' evaluations help to verify if the development project is on the right track. These evaluations may be conducted many times during the project.

2.4 Comparative evaluation

Comparative evaluations are full-fledged evaluations conducted using matrices which can be comparable across similar systems. It is, in other words, a benchmarking process to find out the worth of any DL. In this method, one uses evaluation techniques to compare them with similar systems.

3 DL evaluation framework

In order to design a framework for DL evaluation, it is necessary to identify major components characterizing the dimensions of a DL environment. The three main components in the DL domain are users, content, and technology. Service is also an important parameter, but in a DL environment, it is often associated with the content. It is necessary to look into these three parameters in detail to construct an effective framework for DL evaluation.

3.1 Users

Be it a traditional library or a digital library, users are the most important component of the information chain. Unless we are sure about who the DL users are and what their information requirements are, we may not be able to evaluate the DL effectively. Some of the issues to be addressed with regard to the DL users (Fuhr, et al, 2005) are:

- Who are they? (like researchers, professionals, students, internal, external, etc.)
- How do they access the information? (information seeking behaviour)
- What type of information do they need? (subject area)
- Why do they need the information? (purpose)

3.2 Content

The collection may vary according to the objectives of the DL. It may have primary objects like reports, etc. and secondary objects like bibliographic descriptions and metadata schemes. The collections may also be in different formats like text, audio, video, etc.

The issues to be addressed are:

- Content type (text, audio, video, etc.),
- Metadata schemes (bibliographic organization, indexing, thesaurus, citation, etc.)

- Content quality (relevance, subject coverage, etc.)

3.3 Technology

The technological issues can be further subdivided into four areas; user interface, access management, system structure and document technology. User interface deals with various options provided by the DL to the users and how easily they can access the content. For accessing the information, the system should have effective navigation tools and retrieval techniques. System structure deals with the architecture of the system like database, middle-ware, protocols, etc. used in building the system. Document technology deals with the issue of representation of documents. The document model describes the abstract structure of documents such as the hierarchical /hyperlinked logical structure, semantic content, and external attributes. The document format specifies the internal document representation like DOC, PDF, RTF, etc.

4 DL Evaluation Techniques

There are various techniques for conducting the evaluation of DLs. The method to be used depends on the type of the DL and purpose of the evaluation. Some of the commonly used techniques are transaction log analysis, survey methods, interviews & focus groups, and observations.

4.1 Transaction log analysis

Transaction log analysis is one of the most commonly used methods for DL evaluation. It is a dependable method for obtaining the quantitative data for the evaluation. Originally this method was developed for evaluating the OPACs by libraries. It can be used as an effective tool for evaluation when it is used along with other evaluation tools (Tenopir, 2003). It helps to understand factors such as who uses the DL, what do they use, how long do they use, etc.

The following information can be obtained by analyzing the transaction logs (Tenopir, 2003):

· Frequency of feature use
· Sequence of feature use
· System response times
· Hit rates
· Error rates
· User actions to recover from errors
· Number of simultaneous users
· User session lengths
· Number of transactions per session
· Location of users

The transaction log analysis is an effective way for generating the user statistics.

4.2 Survey methods

Survey is one of the oldest methods for data collection used by libraries. The most common form of conducting a survey is through questionnaires. The questions to be included should be carefully selected. Closed or open ended questions can be used. For best results, questions should be unambiguous and simple. Nowadays, web-based forms are commonly used for conducting surveys. Many software tools are available for analyzing and interpreting the data collected through such forms.

Statistical tools are also needed in the analysis and interpretation of survey results. Sampling techniques can also be applied if the domain size is too large.

4.3 Interviews & Focus groups

Interviews are a very reliable method for capturing qualitative data for evaluation. They can be conducted on a one-to-one basis or in groups, as informal or 'casual' or in a structured and formal approach. The major advantage of conducting interview is that it provides the participants an opportunity to speak their mind instead of responding to the questionnaires.

4.4 Observations

Observations are a controversial method and can only be used as an informal process. People tend to see observation as an intrusion to their privacy.

The bibliometric methods have also been applied by the researchers for evaluation. However, more research needs to be carried out to find a completely reliable method of evaluation.

5 DL evaluation examples

DL evaluation is an emerging area of research interest for library and information science professionals around the world. Brief description of some of the significant DL evaluation projects is given below:

5.1 Equinox

EQUINOX is a project funded under the Telematics for Libraries Programme of the European Commission. This project addresses the need of all libraries to develop and use methods for measuring performance in the new networked, electronic environment, alongside traditional performance measurement, and to operate these methods within a framework of quality management.

The project has two main objectives. Firstly, EQUINOX aims to further develop existing international agreement on performance measures for libraries, by expanding these to include performance measures for the

electronic library environment. The second aim is to develop and test an integrated quality management and performance measurement tool for library managers.

5.2 LibQUAL+

LibQUAL+(TM) is a suite of services that libraries use to solicit, track, understand, and act upon users' opinion of service quality. These services are offered to the library community by the Association of Research Libraries (ARL). The centerpiece of the program is a rigorously tested web-based survey bundled with training that helps libraries assess and improve library services, change organizational culture, and market the library.

The LibQUAL+(TM) survey evolved from a conceptual model based on the SERVQUAL instrument, a popular tool for assessing service quality in the private sector. The Texas A&M University Libraries and other libraries used modified SERVQUAL instruments for several years; those applications revealed the need for a newly adapted tool that would serve the particular requirements of libraries. ARL, representing the largest research libraries in North America, collaborated with Texas A&M University Libraries to develop, test, and refine LibQUAL+(TM). This effort was supported in part by a three-year grant from the U.S. Department of Education's Fund for the Improvement of Post-Secondary Education.

5.3 eVALUEd

The eVALUEd Project, housed within the evidence base at the UCE Birmingham, was setup to develop a transferable model for e-library evaluation in higher education and to provide dissemination and training in e-library evaluation. This project is funding through HEFCE.

The project not only provides standard questionnaire and survey tools for evaluating key aspects of DL services but also guidelines for interpreting the survey results.

5.4 COUNTER - Counting Online Usage of Networked Electronic Resources

In 2003, COUNTER was formally incorporated in England as a not-for-profit company, Counter Online Metrics. The International Advisory Board of COUNTER consists of leading experts from the publishing, library and intermediary world. It provides a set of standards and protocols governing the recording and exchange of online usage data. It has published two COUNTER Codes of Practice known as COUNTER code of practice for Journals & Databases (2005) and COUNTER code of practice for Books & Reference (2006). Both these codes are standards which tell database vendors, how to record the online database usage statistics.

5.5 SUSHI - Standardized Usage Statistics Harvesting Initiative

It is a protocol (Z39.93) and a proposed standard that can be used by electronic resource management and other systems to automate the transport of COUNTER formatted usage statistics. The SUSHI protocol is a standard client/server web services SOAP (Simple Object Access Protocol) request/response for the XML version of the COUNTER report.

The SUSHI standard is the high-level framework in which the SUSHI Schema, SUSHI WSDL, and COUNTER reports operate. The SUSHI WSDL describes, with a high level of abstraction, how the client and server sides of the web services transaction will interoperate. The WSDL gives information referring to the lower level, more detailed and specific information about the transaction, which is described in the schema. The schema is the XML code that is used to perform the SUSHI operation. Variable information in the schema is modified at the time of code execution The COUNTER XML report is the actual payload of the transaction.

The primary benefit of SUSHI is that it automates a tedious and repetitive process. Current practice of statistics retrieval calls for library staff to go to each individual publisher's website and retrieve statistical data. In some cases, this data is in COUNTER format, but sometimes in the publisher's own internal format. Occasionally it is available only through a web screen which can be printed but not downloaded. The SUSHI protocol automates the process; but also, by default, causes the publisher to put usage data into a standard format (COUNTER XML). Therefore the retrieval is not only automatic but far easier to use.

6 Case Study

The digital library at Management Development Institute[1] (MDI) was launched in mid 2005. The objective of the DL was to provide a single-window access to various online resources and services being offered by the library. The DL architecture involved a host of hardware and software. The main DL server is supported by four servers at the back-end namely *Libsys*[2] server for web OPAC, *Dspace*[3] server for institutional digital repository, CD mirror server for CD/DVD based audio-visual materials and a server for hard-disk based databases. It is also connected with a VPN (Virtual Private Network) for facilitating access for external users.

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[1] Management Development Institute is a top ranked business school based at Gurgaon, India. It offers post-graduate and Ph.D. programmes in the area of management sciences.

[2] Libsys is a popular library management system (LMS) used by Indian libraries.

[3] Dspace is a software tool for building institutional repositories jointly developed by MIT and HP Labs.

Major content/services included in the DL are:

- Online journals
- e-books
- Web OPAC
- Institutional repository (DSpace)
- Offline databases
- Online databases
- CD/DVD based training tools
- Services (ILL, CAS, etc.)
- Information about the library

Each of the above is subdivided into further categories. Access to the online resources is IP based. Hence the user does not have to login for accessing individual resources.

There are around 1000 users of the DL consisting of faculty, research scholars, post-graduate students, and participants of short-term training programmes. 85% of the users access the DL on Institute's intranet from the MDI campus. Remaining 15% access the same from outside the campus through the VPN server.

A formal evaluation was conducted in mid 2006, a year after the DL was established various methodologies were used to obtain both quantitative and qualitative data for evaluation.

Following methods were used for different categories of users:

- *Informal interviews* with faculty
- *Group sessions* for researchers
- *Questionnaire* for students
- *Transaction log analysis* for collecting quantitative data

Instead of individuals, the study was limited to studying the usage pattern of various groups like faculty, researchers, etc. and the results of the evaluation provided useful insights into the usage pattern of these groups. A few interesting findings of the study were the low awareness level about various resources available in the DL ,and the preference to use the same resources repeatedly instead of other resources of similar nature.

The results of the evaluation were used in:

- *Collection development policy* – it was found that the majority of users prefer using online journals instead of print version. Hence a decision has been taken to subscribe to online journals wherever possible.

- *DL user interface re-design* – majority of users preferred simple and easy to access DL interface
- *User education* – a large percentage of users were unable to use various resources/databases available in the DL due to lack of training. Many training programmes were organized for such users to make them comfortable with the DL.
- *Internal marketing* – the evaluation confirmed that there was a low level of awareness about the DL in general and various services/content available in it amongst many sections of users. Appropriate steps were taken to increase the awareness about the DL amongst the core set users

7 Conclusion

Digital libraries have revolutionized the concept of information services by reaching out to the users as never before. Digital library technologies have also greatly improved in the recent past with the advent of open source software for DLs. DL technologies are under constant development and change, hence evaluation is also necessary to ensure that the development is in the right direction. Needless to say that, as the DL technologies are under constant change, the evaluation methodologies would also need to change and further research in this area is necessary for that to happen.

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